

Unit 3, Chapter 1-2: Equations & Inequalities

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Algebraic Thinking

3

Objective: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. |



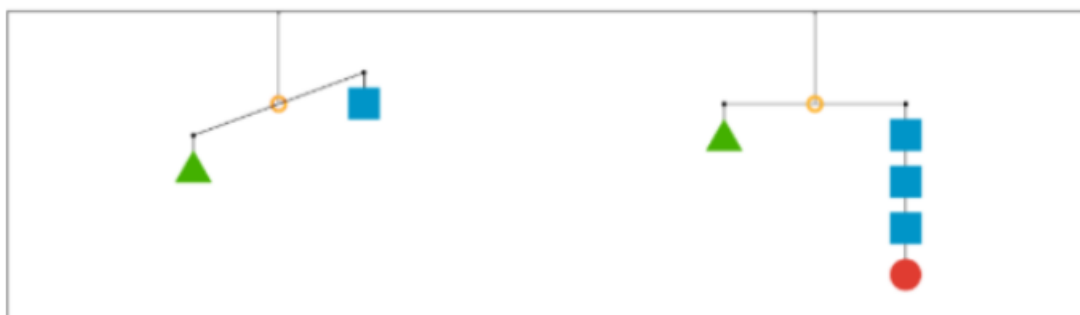
What do you notice?

What do you wonder?

> Student answers

Summary:

4

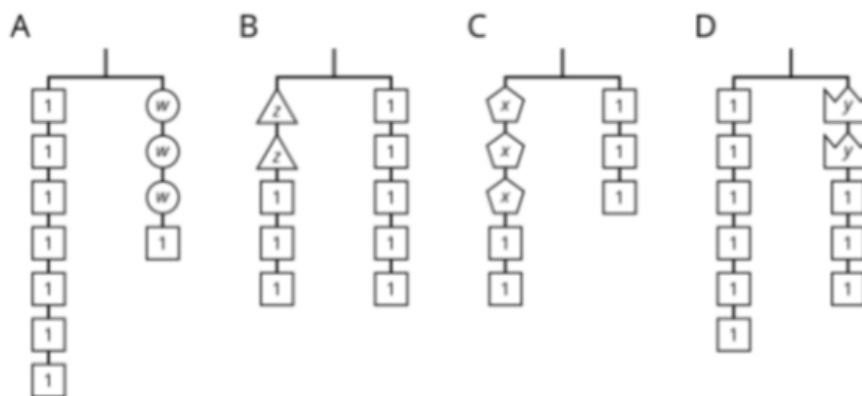


What is one thing that MUST be true?

What is one thing that MIGHT be true?

What is one thing that CANNOT be true?

Student answers



• $2\boxed{z} + 3 = 5$

• $3\boxed{x} + 2 = 3$

• $6 = 2\boxed{y} + 3$

• $7 = 3\boxed{w} + 1$

(B)
(C)
(D)
(A)

Solve me mobiles

Solving One Step Equations

5

Objective: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically.

An equation is a mathematical sentence that shows two expressions are equal. If an equation contains a variable the value for the variable that makes the equation true is called a Solution.

$$3 + 2x = 21$$

constant \nearrow \nwarrow Coefficient \nwarrow variable

Before solving an equation, always check that it is in Simplified form first. This means completing any distribution or combination of like terms. Once simplified, equations can be solved by following order of operations (PEMDAS) backwards using inverse operations.

Solve the following equations.

<p>A. $x + 12 = 4$</p> $\begin{array}{r} x + 12 = 4 \\ -12 \quad -12 \\ \hline x = -8 \end{array}$ <p>$x = -8$</p>	<p>B. $-18 + x = 22$</p> $\begin{array}{r} -18 + x = 22 \\ +18 \quad +18 \\ \hline x = 40 \end{array}$ <p>$x = 40$</p>	<p>C. $x + 7 = -10$</p> <p>$x = -17$</p>
<p>D. $x - 3 = 13$</p> <p>$x = 16$</p>	<p>E. $4x = 36$</p> $\begin{array}{r} 4x = 36 \\ \frac{4}{4} \quad \frac{4}{4} \\ \hline 1x = 9 \end{array}$ <p>$x = 9$</p>	<p>G. $-5x = -25$</p> $\begin{array}{r} -5x = -25 \\ \frac{-5}{-5} \quad \frac{-5}{-5} \\ \hline 1x = 5 \end{array}$ <p>$x = 5$</p>

H.	I.	$\left(\frac{6}{1}\right) \frac{1}{6} x = 6(6) \textcircled{6}$ $\frac{6x}{6} = 36$ $x = 36$
$\left(\frac{-5}{1}\right) - \frac{1}{5} x = -3(-5)$ $\frac{5x}{5} = 15$ $x = 15$	$L. \quad 8x - 9x = 4$ $\frac{-1x}{-1} = \frac{4}{-1}$ $1x = -4$ $x = -4$	$M. \quad 10x = 16 + 4$ $\frac{10x}{10} = \frac{20}{10}$ $1x = 2$ $x = 2$

Summary.

28

ALGEBRA WITH PIZZAZZ!
© Creative PublicationsOBJECTIVE 4-8: To solve equations of the form $x + a = b$ (Items in each equation are added).

MOVING WORDS

Solve each equation in the top block and find your solution in the bottom block. Transfer the word from the top box to the corresponding bottom box. Keep working and you will get an interesting question "write" away.

① $w + 8 = -3$ THAT	⑥ $-1 + x = -10$ OUTER	⑪ $100 = n + 20$ DOWN	⑫ $-15 + t = 60$ PEN	
② $x + 12 = 30$ AND	⑦ $h + 13 = 7$ NEW	⑬ $-14 = 3 + x$ ALSO	⑭ $32 = n + 5$ UPSIDE	
③ $d + (-9) = -5$ YOU	⑧ $w + (-4) = 8$ OF	⑮ $28 = h + (-11)$ SEEN	⑯ $w + (-7) = -20$ WORDS	
④ $12 + n = 7$ IN	⑨ $2 + x = 24$ SPACE	⑰ $-36 = -12 + n$ UNDERWATER	⑱ $52 = -48 + x$ WRITES	
⑤ $-9 + x = 15$ THE	⑩ $-16 + d = 30$ HAVE	⑲ $w + 40 = -25$ LOTS	⑳ $15 + n = -15$ OTHER	
46	4	39	24	-6
75	-11	100	-24	27
80	-5	-9	22	18
-17	-65	12	-30	-13
				?

⑦

class work
& homework

Moving words

Name

① $w + 8 = -3$

$\begin{array}{r} -8 \quad -8 \\ \hline w + 8 = -11 \end{array}$

$w = -11$

DID YOU HEAR ABOUT ...

A	B	C	D	E
F	G	H	I	J
K	L	M	N	O
P	Q	R	S	T
				?

Solve each equation below. Find the solution in the appropriate answer column and notice the word next to it. Write this word in the box containing the letter of that exercise. Keep working and you'll hear about something that is really "fur" out!

Answers A-J:

19 BIG

16 A

-18 WHO

-2 MORE

32 THE

7 THOUSAND

-25 ON

27 FUR

55 LADY

3 TEN

41 WAS

-70 SPENT

(A) $\frac{1}{8}x = 4$

(B) $\frac{1}{5}x = 11$

(C) $\frac{1}{9}y = -2$

(D) $\frac{1}{2}m = -35$

(E) $6p = 18$

(F) $12t = 84$

(G) $3x = -33$

(H) $-4n = 100$

(I) $-3u = -48$

(K) $-72 = 8x$

(L) $\frac{1}{4}w = 16$

(M) $13 = -\frac{1}{6}y$

(N) $-18 = -\frac{1}{2}y$

(O) $\frac{1}{2}r = \frac{5}{2}$

(P) $-\frac{1}{3}t = \frac{4}{3}$

(Q) $-\frac{3}{4} = -\frac{1}{8}x$

(R) $11u = -88$

(S) $400 = -20w$

Answers K-T:

-78 SHE

-20 IN

-1 IT

-9 COAT

5 TO

6 THE

36 WANTED

-8 MISS

-4 BE

64 BECAUSE

30 WARM

10 LYNX

⑧

class work
&
homework

○ Did You Hear About... .

○ (A) $\frac{1}{8}x = 4$

○

Solving with Rational Coefficients ⑨

Objective: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically.

Rational coefficients include coefficients that are decimals and fractions

When a coefficient is a decimal, divide each side by the coefficient.

Ex:

$$\begin{array}{r} -1.5x = 6 \\ \underline{-1.5} \quad \underline{-1.5} \\ 1x = -4 \\ \text{X} = -4 \end{array}$$

Ex:

$$\begin{array}{r} .20x = -10 \\ \underline{.20} \quad \underline{.20} \\ 1x = -50 \\ \text{X} = -50 \end{array}$$

When a coefficient is a fraction, multiply each side by the reciprocal

Ex:

$$\left(\frac{3}{2}\right) \frac{2}{3}x = 12 \left(\frac{3}{2}\right)$$

$$\begin{array}{r} \frac{6}{6}x = \frac{36}{2} \\ 1x = 18 \\ \text{X} = 18 \end{array}$$

Ex:

$$\left(\frac{5}{4}\right) -\frac{4}{5}x = -4 \left(\frac{5}{4}\right)$$

$$\begin{array}{r} \frac{20x}{20} = \frac{20}{4} \\ 1x = 5 \\ \text{X} = 5 \end{array}$$

Solve the following equations.

10

A.

B.

C.

$$\left(\frac{3}{1}\right) \frac{1}{3}x = -5 \left(\frac{-3}{1}\right)$$

$$\frac{3}{3}x = -15$$

$$1x = -15$$

$$x = -15$$

D.

$$\left(-\frac{5}{3}\right) -\frac{3}{5}x = 3 \left(-\frac{5}{3}\right)$$

$$\frac{15}{15}x = -15$$

$$1x = -15$$

$$x = -15$$

E.

$$-\frac{3}{8}x = -9$$

$$x = 24$$

F.

$$\frac{2}{3}x = \frac{8}{9}$$

$$x = \frac{4}{3} \text{ or } 1\frac{1}{3}$$

G.

$$\frac{5}{4}x = -3\frac{1}{8}$$

~~$$\left(\frac{4}{5}\right) \frac{5}{4}x = -\frac{25}{8} \left(\frac{4}{5}\right)$$~~

$$1x = -\frac{5}{2}$$

$$x = -\frac{5}{2} \text{ or } -2\frac{1}{2}$$

H.

Solving Two Step Equations

11

Objective: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically.

A company charges \$0.75 for each balloon in an arrangement and a \$3 delivery fee. You are charged a total of \$9.00 before tax or tip is applied. How many balloons did you order?

$$9 - 3 = 6 \div 0.75 = 8$$

$$0.75(8) + 3 = 9$$

8
2
12

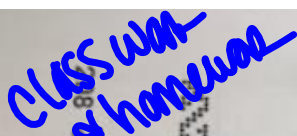
Order of operations (aka PEMDAS) ensures that numerical expressions only have one value. To reverse operations, undo them in reverse order. Remember, both sides of an equation must be equal to one another. What is done to one side, MUST be done to the other.

Solve the following equations.

PEMDAS

<p>A. $0.75x + 3 = 9$</p> $\begin{array}{r} 0.75x + 3 = 9 \\ -3 \quad -3 \\ \hline 0.75x = 6 \\ \div 0.75 \quad \div 0.75 \\ \hline x = 8 \end{array}$	<p>B. $3x + 2 = 23$</p> $\begin{array}{r} 3x + 2 = 23 \\ -2 \quad -2 \\ \hline 3x = 21 \\ \div 3 \quad \div 3 \\ \hline x = 7 \end{array}$
<p>C. $-2x - 7 = 3$</p> $\begin{array}{r} -2x - 7 = 3 \\ +7 \quad +7 \\ \hline -2x = 10 \\ \div -2 \quad \div -2 \\ \hline x = -5 \end{array}$	<p>D. $4 + \frac{1}{5}x = -1$</p> $\begin{array}{r} 4 + \frac{1}{5}x = -1 \\ \downarrow \\ x = -25 \end{array}$
<p>E. $-7 = 1 - \frac{2}{3}x$</p> $\begin{array}{r} -7 = 1 - \frac{2}{3}x \\ -1 \quad -1 \\ \hline -8 = -\frac{2}{3}x \\ \times (-\frac{3}{2}) \quad \times (-\frac{3}{2}) \\ \hline 12 = x \end{array}$	<p>F. $27 + 8.5x = 78$</p> $\begin{array}{r} 27 + 8.5x = 78 \\ \downarrow \\ x = 6 \end{array}$

Summary:



Daffynition Decoder

1. Condense: 2

2. Program:

Solve any equation below and find the solution in the code. Each time it appears, write the letter of the exercise above it. Keep working and you will decode the two de-fun-itions.

$$\textcircled{R} \quad \frac{x}{2} - 5 = 11$$

$$\textcircled{0} \quad \frac{w}{7} + 4 = 6$$

$$\textcircled{Y} \quad \frac{1}{3}t - 9 = 3$$

Ⓔ $7y - 2 = 26$

Ⓐ $8 - 4k = 40$

$$\textcircled{A} \quad -\frac{1}{5}k + 1 = 11$$

$$\textcircled{\text{N}} \quad 7 + \frac{m}{8} = -2$$

$$\textcircled{\text{U}} \quad 47 = 2d + 5$$

$$\textcircled{\text{H}} \quad -6u + 7 = -29$$

© $12 - \frac{v}{4} = 1$

$$\textcircled{L} -6 - \frac{1}{2}n = 8$$

$$\textcircled{F} \quad -61 = 12p - 1$$

$$\textcircled{T} \quad \frac{1}{10}y + 2 = -16$$

Ⓓ $18 - \frac{x}{15} = 15$

⑤ $3 + 5q = 98$

$$\textcircled{\text{S}} \quad -6 + \frac{1}{3}w = 0$$

① $10 - x = 50$

$$\textcircled{M} \quad -\frac{v}{9} + 7 = 14$$

Daffynition Decoder Name

Ⓟ $\frac{X}{2} - 5 = 11$

$+5 \quad +5$

$(\frac{2}{1}) \quad \frac{1}{2} X = 16(2)$

$2 \times$

$X = 32$

In N Out Task

13

[https://docs.google.com/presentation/d/](https://docs.google.com/presentation/d/1jzHkjEY33FUY1S87odMv_nsmKZ13m6c42lOjumv26OE/edit?usp=sharing)

[1jzHkjEY33FUY1S87odMv_nsmKZ13m6c42lOjumv26OE/edit?usp=sharing](https://docs.google.com/presentation/d/1jzHkjEY33FUY1S87odMv_nsmKZ13m6c42lOjumv26OE/edit?usp=sharing)



Notice

- patties ↑ shiny/toasty
- 2 buns always & tomatoes/lettuce
- cheese ↑
- grilled onions

Wonder

- What happened? ^{didn't come}
- Why? ^{order} patties ^{did the} ^{order from}
- how
- What's the secret sauce
- maybe we're missing something
- on ^{the} ^{menu} ^{is} ^{it}
- who

Question

How much does a 100 x 100 In Nout cheeseburger cost?

Info

Cheeseburger

- 2 buns
- 1 patty
- 1 cheese
- 1 topping set

\$1.75

Double-Double

- 2 buns
- 2 patty
- 2 cheese
- 1 topping set

\$2.65

Work 3

x	# of patties	Cost y
	0	\$0.85
	1	\$1.75
	2	\$2.65
	3	\$3.55
	4	\$4.45
	5	\$5.35
	10	\$9.85
	20	\$18.85
	100	\$90.85

14

Answer: A 100 x 100 in N out cheeseburger costs
 because

Solving Multi-Step Equations 15

Objective: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically.

The table shows the number of students in each FLEX class. Write an equation and solve to find the number of students in Mrs. Brophy's FLEX class if the total number of students between the listed classes is 90.

$$\begin{aligned}
 B + P + W + S &= 90 \\
 b + 1.5(b+2) + 15 + 2b - 9 &= 90 \\
 \underline{1b + 1.5b + 3 + 15 + 2b - 9} &= 90 \\
 \underline{4.5b + 19} &= 90 \\
 \underline{-19} &\quad \underline{-19} \\
 4.5b &= 71 \\
 \underline{4.5} &\quad \underline{4.5} \\
 b &= 15.777...
 \end{aligned}$$

Teacher	# of Students
Mrs. Brophy	b 18
Mr. Pepes	$1.5(b + 2)$ 30
Mr. Welch	15
Mrs. Sproul	$2b - 9$

How many students are in Mr. Pepes' FLEX class?

30

How many students are in Mrs. Sproul's FLEX class?

21

Solve the following equations.

A. $-6x - 2x = 16$

$$\begin{aligned}
 -6x - 2x &= 16 \\
 -8x &= 16 \\
 \underline{-8} &\quad \underline{-8} \\
 x &= -2
 \end{aligned}$$

B. $4x + 6 + 3 = 17$

$$\begin{aligned}
 4x + 6 + 3 &= 17 \\
 4x + 9 &= 17 \\
 \underline{-9} &\quad \underline{-9} \\
 4x &= 8 \\
 \underline{4} &\quad \underline{4} \\
 x &= 2
 \end{aligned}$$

C. $3(3x - 6) = 18$

$x = 4$

D. $30 = -5(6x + 6)$

$x = -2$

<p>E. $-3 + 5(x + 6) = 37$</p> <p>$x = 2$</p>	<p>F. $-13 = 5(1 + 4x) - 2x$ 16</p> <p>$-13 = 5 + 20x - 2x$</p> <p>$-13 = 5 + 18x$</p> <p>$-5 - 5$</p> <p>$-18 = 18x$</p> <p>$x = -1$</p>
<p>G. $10(1 + 3x) = -20$</p> <p>$10 + 30x = -20$</p> <p>$-10 - 10$</p> <p>$30x = -30$</p> <p>$x = -1$</p>	<p>H. $-6(1 - 5x) = 54$</p> <p>$x = 2$</p>
<p>I. $0 = -5x - 2x$</p> <p>$x = 0$</p>	<p>J. $x + 11 + 8x = 29$</p> <p>$x = 2$</p>
<p>K.</p>	<p>L.</p>
<p>M.</p>	<p>N.</p>

Summary:

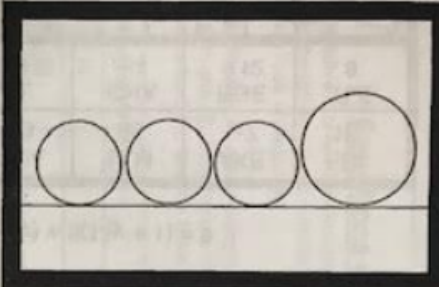
17

210 PRE-ALGEBRA WITH PIZZAZZ!
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What Is The Title Of This Picture?

CODED TITLE

18 -6 6 2 -5 -7 2 -5 -3 6 -5
7 -1 4 -4 -7 8 -5 -3 -7
-13 6 2 1 -3 -1 3 8 4 -13 -7 -2



TO DECODE THE TITLE OF THIS PICTURE

Solve any equation below and find the solution in the code above. Each time the solution appears, write the letter of that exercise above it. Keep working and you will discover the title.

Ⓘ $5(x + 4) = 40$

Ⓔ $-2(3y - 7) = 56$

Ⓒ $6(1 - 4w) = -18$

Ⓕ $4(2x + 5) - 8 = 36$

Ⓐ $2(5 - 3v) + 9v = 28$

Ⓔ $7 - 3(5t - 10) = 67$

Ⓐ $-9(6 + u) - 2u = -10$

Ⓐ $13x + 7(-3x - 1) = -63$

Ⓕ $15 - (4m - 5) = 32$

Ⓐ $-2(-7k + 4) + 9 = -13$

Ⓐ $-5y - 5(-6 - 2y) = 0$

Ⓐ $3(1 + 4n) - 2(5n - 3) = 25$

Ⓐ $-6(x - 2) + 4(3 - 6x) = -36$

Ⓐ $5(4 + 2x) - (8x - 12) = 68$

Ⓐ $-3(-4 - 6y) + 7(-y + 5) = -8$

Ⓐ $8(2w - 6) + 4(-1 - 5w) = 0$

What's the Title...

Name

①

$$5(x+4)=40$$

$$\begin{array}{r} 5x + 20 = 40 \\ -20 \quad -20 \\ \hline 5x \quad = 20 \\ \underline{5} \quad \underline{5} \end{array}$$


$$x=4$$

40 ALGEBRA WITH PIZZAZZ! © Creative Publications

What Were the Headlines After a 3 Foot 10 Inch Fortuneteller Escaped From Jail?

Solve each equation and find your solution below. Cross out the box containing that solution. When you finish, write the letters from the remaining boxes in the spaces at the bottom of the page.

Extra credit



1 $3(2x + 5) = 39$

2 $2(6k - 1) = -38$

3 $8(7 - y) = -24$

4 $-4(8 + 5n) = 8$

5 $6(3x - 5) - 7x = 25$

6 $-2(5 + 6m) + 16 = -90$

7 $15(t + 2) + 9t = 6$

8 $7w - 3(4w + 8) = 11$

9 $22 - 5(6v - 1) = -63$

10 $18x - (8x - 7) = 67$

11 $8(-2x - 4) + 12 = -52$

12 $2(9n - 1) + 7(n + 6) = -60$

13 $-3(3x + 15) - (10 + x) = 35$

14 $11(4 - 6y) + 5(13y + 1) = 9$

MID 5	THE -9	GET -1	SMA 12	SHA 2	RTF 40	AWA -3	LLM 35	AKE -7	EDI 15
TOR -2	UMA -14	PRI 6	UNJ 4	TLA -20	SON 3	AIL 10	CHA -4	RGE -12	TLE 8

OBJECTIVE 4-m: To solve equations containing parentheses.

Equations with Variables on Each Side

19

Objective: Students will write and solve equations with variables on both sides.

Cell Phones: A wireless company offers two cell phone plans. Plan A charges \$24.95 per month plus \$0.10 per minute for calls. Plan B charges \$19.95 per month plus \$0.20 per minute for calls. Use the table below to determine when both plans will cost the same.

Minutes (m)	Plan A = $24.95 + 0.10m$	Plan B = $19.95 + 0.20m$
10	$24.95 + 0.10(10) = 25.95$	$19.95 + 0.20(10) = 21.95$
20	$24.95 + 0.10(20) = 26.95$	$19.95 + 0.20(20) = 23.95$
30	$24.95 + 0.10(30) = 27.95$	$19.95 + 0.20(30) = 25.95$
40	$24.95 + 0.10(40) = 28.95$	$19.95 + 0.20(40) = 27.95$
50	$24.95 + 0.10(50) = 29.95$	$19.95 + 0.20(50) = 29.95$
60	$24.95 + 0.10(60) = 30.95$	$19.95 + 0.20(60) = 31.95$
70	$24.95 + 0.10(70) = 31.95$	$19.95 + 0.20(70) = 33.95$

- 1.) For what value(s) does Plan A cost less?

When $m > 50$

- 2.) For what value(s) does Plan B cost less?

When $m < 50$

- 3.) For what value(s) do both Plan A and Plan B cost the same? How much do they cost?

at 50 min, both will cost
\$29.95

How might this be solved **algebraically**?

Plan A = Plan B

$24.95 + 0.10(50) = 19.95 + 0.20m$

$24.95 - 19.95 = 0.10m$

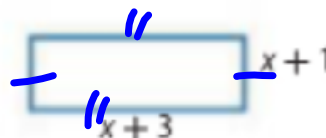
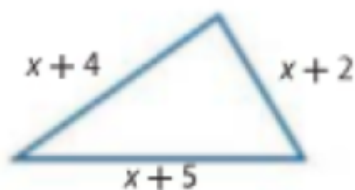
$5 = m$

Rental Cars: EZ Rental charges \$40 per day plus \$0.25 per mile. Ace Rent-A-Car charges \$25 per day plus \$0.45 per mile. What number of miles results in the same cost per day? What is the cost?

$$\begin{array}{rcl}
 \text{EZ} & = & \text{Ace} \\
 40 + 0.25m & = & 25 + 0.45m \\
 -0.25m & & -0.25m \\
 \hline
 40 & = & 25 + 0.20m \\
 -25 & & -25 \\
 \hline
 15 & = & 0.20m \\
 \frac{15}{0.20} & & \frac{0.20m}{0.20} \\
 75 & = & m
 \end{array}$$

Handwritten notes: \$58.75 (twice), 75 = m

Perimeter: Write and solve an equation to find the value of x so that each pair of polygons has the same perimeter.



$$\begin{array}{rcl}
 P_{\triangle} & = & P_{\square} \\
 x+4 + x+5 + x+2 & = & 2(x+1) + 2(x+3) \\
 3x+11 & = & 2x+2 + 2x+6 \\
 3x+11 & = & 4x+8 \\
 -3x & & -3x \\
 \hline
 11 & = & 1x+8 \\
 -8 & & -8 \\
 \hline
 3 & = & x
 \end{array}$$

Handwritten notes: 20 (twice), 3 = x

21

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PRE-ALGEBRA WITH PIZZAZZ!
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Super Star

Solve the equations at the right and find the solutions below.
Connect the dots in the order of the numbered equations. You
may go through the same dot more than once.

THIS PUZZLE WILL MAKE YOU A STAR!

• -15

• 11

• -17

• 13

• 10

• 15

• -14

• 22

• -30

• -8

• 18

• -16

• -25

• -2

• 4

• -21

• -12

• 1

• 20

• 12

• -7

• -19

• 5

• 16

• 3

start

• -11

• -3

• 5

• 6

• 19

• -9

• -3

• 5

① $5x + 6 = 2x + 15$

② $7x - 4 = 20 + 3x$

③ $2x + 15 = 43 - 5x$

④ $3 + 4x = 9x + 13$

⑤ $2x - 10 = 44 + 8x$

⑥ $-7x - 2 = 24 - 9x$

⑦ $27 - 11x = x - 33$

⑧ $21x + 6 = 17x - 26$

⑨ $11x = 8x - 6$

⑩ $-x - 29 = 13 + 2x$

⑪ $-18 + 5x = -12x - 1$

⑫ $-9x - 21 = 35 - x$

⑬ $7x - 2 = -2x - 29$

⑭ $36 + 15x = 17x$

⑮ $-15 - 4x = 6 - 3x$

⑯ $12x - 9 = 8x - 37$

⑰ $-5x + 40 = 6x - 70$

⑱ $-x - 2 = 1 - 2x$

Handwritten notes and markings:

- Blue scribbles and arrows connecting dots 1, 19, 9, 11, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30.
- Green scribbles and arrows connecting dots 1, 19, 9, 11, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30.
- Red stars marking equations 1, 19, 9, 11, 10, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30.

Super Star

Name

$$\begin{array}{rcl} \textcircled{1} 5x + 6 & = & 2x + 15 \\ -2x & & -2x \\ \hline 3x + 6 & = & 15 \\ -6 & & -6 \\ \hline 3x & = & 9 \\ \frac{3x}{3} & & \frac{9}{3} \\ & \searrow & \\ & x = 3 & \end{array}$$

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What Is The Title Of This Picture?

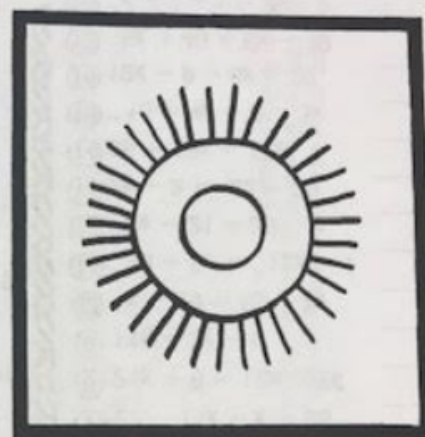
9 10 25 9 8 3 4 25 9 1 7 1 10 14 1 6 1

8 7 6 1 25 4 12 1 4 9 2

8 5 12 25 1 3 3 4

TO DECODE THE TITLE OF THIS PICTURE:

Solve any equation below and find the solution in the coded title. Each time it appears, write the letter of the exercise above it. Keep working and you will decode the title.



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Ⓓ $4(2n - 5) = 3n + 10$

Ⓕ $2(4x + 7) = 2x - 4$

Ⓝ $8(k + 3) = 12k - 4$

ⓗ $-3(5 - 9v) = 25 + 7v$

Ⓐ $6x + 4 = 5(3x + 8)$

Ⓘ $5 - 11t = 7(5 - 2t)$

Ⓑ $-2(18 - 3y) = 7y + 2y$

Ⓜ $2(4a - 12) + 3a = 6a + 1$

Ⓟ $9(2 + w) - 4w = 3w - 10$

Ⓤ $10u + 7 = 8(2u - 4) - 9$

Ⓣ $3(4d + 1) - 9d = 6(2 - d)$

Ⓡ $6(1 + 3m) = -8(-2m + 5) - 4$

Ⓔ $-14 + 3(x + 10) = 7(2x + 4) + x$

Ⓒ $6p - (5p + 5) = -8 - 2(p + 12)$

EC

Special Cases

23

For each of the following scenarios, Hadley and Kona are racing in a marathon! At what time(s) will Hadley and Kona be side by side on the course? Translate the following scenarios into equations and solve to find out.

Scenario #1: Hadley runs an average speed of 5 miles per hour. He is given a 1 mile head start. Kona runs an average speed of 6 miles per hour. She is not given a head start. Will Kona catch up to Hadley? If so, at what time (in hours) will they be side by side on the race course?

$$\begin{array}{rcl}
 H & = & K \\
 5h + 1 & = & 6h + 0 \\
 -5h & & -5h \\
 \hline
 1 & = & 1h \\
 \downarrow & & \\
 1 & = & h
 \end{array}$$

At hr 1
H & K will
be side
by side

Scenario #2: Hadley runs an average speed of 5 miles per hour. He is given a 1 mile head start. Kona runs an average speed of 6 miles per hour. She is also given a 1 mile head start. At what time (in hours) will they be side by side on the race course?

$$\begin{array}{rcl}
 H & = & K \\
 5h + 1 & = & 6h + 1 \\
 -5h & & -5h \\
 \hline
 1 & = & 1h + 1 \\
 -1 & & -1 \\
 \hline
 0 & = & h
 \end{array}$$

At hr 0
H & K will
be side
by side

Scenario #1 and #2 are examples of equations with ONE solution, meaning only ONE number will make the scenario true. ZERO is a number! An equation will have one solution when one side has a variable and the other has a number value.

EX:

$$\begin{array}{l}
 x = 1 \\
 x = 0
 \end{array}$$

$$x = 2.5$$

$$x = \frac{3}{4}$$

$$x = -5$$

*****24
Scenario #3: Hadley runs an average speed of 5 miles per hour. He is given a 1 mile head start. Kona also runs an average speed of 5 miles per hour. She is also given a 1 mile head start. At what time (in hours) will they be side by side on the race course?

$$\begin{array}{r} H = K \\ 5h + 1 = 5h + 1 \\ -5h \quad -5h \\ \hline 1 = 1 \\ 0 = 0 \end{array}$$

$H = K$
 Will always be side by side

Scenario #3 is an example of an equation with infinite solutions, meaning any and all numbers will make the scenario true. An equation will have infinite solutions when both sides are identical.

EX:

$$x = x$$

$$1 = 1$$

$$0 = 0$$

$$2x + 1 = 2x + 1$$

∞ sol.

Scenario #4: Hadley runs an average speed of 5 miles per hour. He is given a 1 mile head start. Kona also runs an average speed of 5 miles per hour. She is not given a head start. Will Kona catch up to Hadley? If so, at what time (in hours) will they be side by side on the race course?

$$\begin{array}{r} H = K \\ 5h + 1 = 5h \\ -5h \quad -5h \\ \hline 1 = 0 \\ 0 = -1 \end{array}$$

$H \neq K$
 Will never be side by side.

Scenario #4 is an example of an equation with NO solution, meaning NO number will make the scenario true. This can also be stated as being a null set.

EX:

$$1 = 0$$

$$1 = -1$$

$0 = 0$ & $0 = 1$

No sol.

 On a separate piece of paper, solve the following equations. Specify if each equation has one solution, infinite solutions, or no solutions.

1.) $-3(9 + x) = 33$

2.) $4(5 + 2x) - 5 = 3(3x + 7)$

3.) $2(-x + 1) = -2x - 3$

4.) $3(6 - 4x) = -2(6x - 9)$

5.) $6(x - 3) + 10 = 2(3x - 4)$

6.) $8x - 22 = 3(3x + 11) - x$

Special Cases Name

①.

Inequalities

25

Objective: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically.

An inequality is a mathematical sentence that Compares quantities that are not equal. Inequalities include the following symbols:

$<$	$>$	\leq	\geq
less than	greater than	less than or equal to - at least	greater than or equal to - at most

Write an inequality to match each situation.

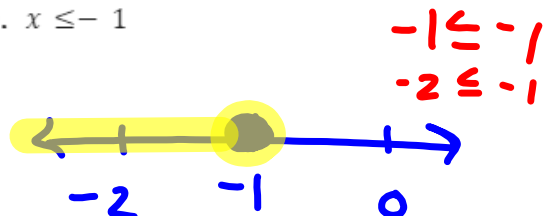
<p>A. You must be at least 18 years old to vote.</p> <p>$x \geq 18$</p> <p>17 (18 19)</p>	<p>B. Children under the age of 2 fly free.</p> <p>$x < 2$</p> <p>1 2 3</p>	<p>C. An elevator has a maximum capacity of 3600 pounds.</p> <p>$x \leq 3600$</p> <p>3500 3600 3700</p>	<p>D. Julia budgets \$500 for wedding cake.</p> <p>$x \leq 500$</p> <p>400 500 600</p>
--	---	--	--

Inequalities with variables are open sentences. When the variable in an open sentence is replaced with a number, the inequality may be true or false. For the given value, state whether each inequality is true or false.

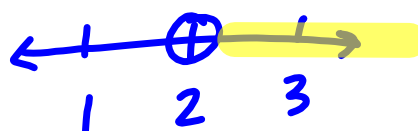
<p>E. $2x + 8 > 7$; $x = -1$</p> <p>$2(-1) + 8 > 7$</p> <p>$-2 + 8 > 7$</p> <p>$6 > 7$ False</p>	<p>F. $x - 42 \leq -2$; $x = 40$</p> <p>$40 - 42 \leq -2$</p> <p>$-2 \leq -2$ True</p>
---	--

Inequalities can be graphed on the number line. The graph helps to visualize the values that make the inequality true. Solve (if needed) and graph the following inequalities. Check your work to prove your solution is true. 26

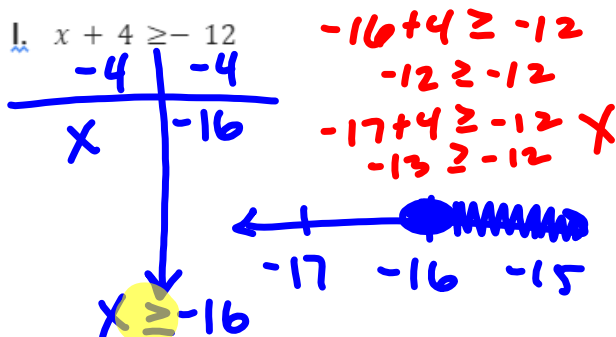
G. $x \leq -1$



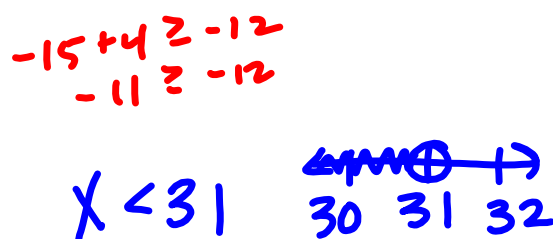
H. $x > 2$



I. $x + 4 \geq -12$



J. $-8 + x < 23$



K. $5x - 5 < 45$



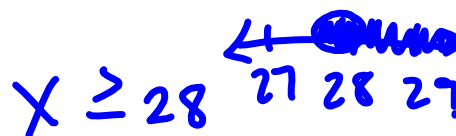
L. $\frac{7}{2}x > 63$



M. $3x + 30 \leq 75$



N. $\frac{x}{4} + 4 \geq 11$



Summary:

More Inequalities

Objective: Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically.

Hadley swears he'll lose weight this year. He hopes to lose at least 2 pounds. He has already lost 0.25 pound! If he continues to lose weight at a rate of 0.50 pound per week, how many weeks will it take him to reach his goal?

$$\begin{array}{rcl}
 .50x + 0.25 & \geq & 2 \\
 -0.25 & -0.25 & \\
 \hline
 .50x & \geq & 1.75 \\
 \cdot \frac{.50}{.50} & & \cdot \frac{.50}{.50} \\
 x & \geq & 3.5
 \end{array}$$

Solve each inequality. Then graph the solution on a number line.

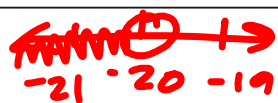
A. $-3x - 18 \leq -12$

$$\begin{array}{rcl}
 +18 & +18 & \\
 \hline
 -3x & \geq & 6 \\
 \div -3 & \div -3 & \\
 x & \leq & -2
 \end{array}$$



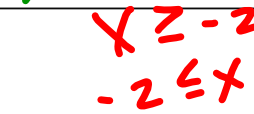
B. $-\frac{3}{4}x - 6 > 9$

$$\begin{array}{rcl}
 +6 & +6 & \\
 \hline
 -\frac{3}{4}x & > & 15 \\
 \cdot \frac{4}{-3} & \cdot \frac{4}{-3} & \\
 x & < & -20
 \end{array}$$



C. $13 - 3x < -8$

$$\begin{array}{rcl}
 -13 & -13 & \\
 \hline
 -3x & < & -21 \\
 \div -3 & \div -3 & \\
 x & > & 7
 \end{array}$$



D. $15 \geq -\frac{x}{4} - 9$

$$\begin{array}{rcl}
 +9 & +9 & \\
 \hline
 (-4)24 & \geq & -x \\
 \div -1 & \div -1 & \\
 -96 & \leq & x
 \end{array}$$



Summary:

* In inequalities when you \times or \div by a negative #
change the direction of inequality symbol.

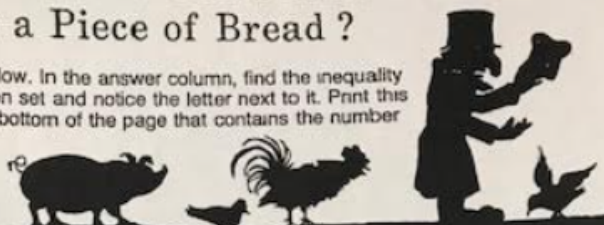
Solve each inequality.

<p>E. $-2(x - 2) \geq -20$</p> <p>$x \leq 12$</p>	<p>F. $(3x + 7)2 \leq -34$</p> <p>$x \leq -8$</p>
<p>G. $-2(x - 1) > x - 4$</p> <p>$x < 2$</p>	<p>H. $5x + 8 \geq 3(x + 6)$</p> <p>$x \geq 5$</p>
<p>I. $20 > 5(x + 3)$</p> <p>$1 > x$</p>	<p>J. $-2x - 2 > -16 + 2x$</p> <p>$\frac{7}{2} > x$</p>
<p>K. $-4x + 16 \geq -4$</p> <p>$x \leq 5$</p>	<p>L. $-4(x + 12) > -(3x + 16)$</p> <p>$-32 > x$</p>

Why Was Professor Clabberhead Utterbunk Holding Up a Piece of Bread?

Solve each inequality below. In the answer column, find the inequality that describes the solution set and notice the letter next to it. Print this letter in each box at the bottom of the page that contains the number of that exercise.

CW & HW



<p>① $5x + 2 > 3x + 10$</p> <p>② $8 + 2x \leq 6x - 20$</p> <p>③ $4x + 49 < 9 - x$</p> <p>④ $9x - 99 \geq 18x$</p> <p>⑤ $3(x - 4) > 15$</p> <p>⑥ $28 < 4(5 - 2x)$</p> <p>⑦ $3(2n + 1) \geq 4n + 9$</p> <p>⑧ $3n - 10 \leq 7(2 + n)$</p> <p>⑨ $-4(2n - 6) < n + 6$</p> <p>⑩ $2(7n - 1) \geq 3(5 - n)$</p> <p>⑪ $7n - 2(n + 5) < 3n - 16$</p> <p>⑫ $4(1 - 3n) - 14 > 4(2n + 3) - 9n$</p>	<p>Ⓛ $n \geq 5$</p> <p>ⓖ $n \geq -6$</p> <p>Ⓐ $x < -8$</p> <p>Ⓞ $n < -3$</p> <p>Ⓡ $x > 4$</p> <p>Ⓢ $x < -1$</p> <p>Ⓤ $x < 10$</p> <p>Ⓜ $x \leq -11$</p> <p>Ⓟ $n \geq 1$</p> <p>Ⓝ $x \geq 7$</p> <p>Ⓣ $n < -2$</p> <p>ⓔ $n \geq 3$</p> <p>Ⓦ $n > 2$</p> <p>Ⓜ $n < -5$</p> <p>ⓗ $x > 9$</p>
<div style="display: flex; justify-content: space-around; font-family: monospace; font-size: 1.2em;"> 57936101111011642 </div>	<div style="display: flex; justify-content: space-around; font-family: monospace; font-size: 1.2em;"> 8312113612 </div>

192 ALGEBRA WITH PIZZAZZ! © Creative Publications
 OBJECTIVE 2-d: To solve inequalities containing parentheses and/or having the variable in both sides

Prof. Clabberhead Name

①